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W1.4 Heavy ions doping coupled with metallic nanoinclusions: An effective way to improve the thermoelectric performance of p-type layered cobalt oxide materials

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Intensive efforts over the past few years to develop oxide polycrystalline thermoelectric materials have led to decisive progress in this area and recently, the highest ZT value for n-type polycrystalline state-of-the-art bulk oxide was achieved with ZT of 0.65 at 1247 K [1]. However, the performance of p-type polycrystalline oxides still remained at a relatively low level.

We have proposed an effective way to improve the thermoelectric performance of layered-structured oxide materials by carefully choosing heavy ion doping and introducing metallic nano-inclusions. A p-type layered-cobalt thermoelectric oxide with remarkable high improved ZT, which reached 0.61 at 1118 K [2], was successfully fabricated using this approach. We were also able to show for the first time that the excellent chemical and thermal stability of this material remains the same over a long period of testing time, suggesting a very promising oxide thermoelectric material for high temperature power generation.

[1] M. Ohtaki, K. Araki, K. Yamamoto, J. Electron. Mater. 2009, 38, 1234.

[2] Ngo Van Nong, Nini Pryds, Søren Linderøth and Michitaka Ohtaki, Adv. Mater. (2011), in press.